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ACHIEVEMENTS AND CO-OPERATION POSSIBILITIES OF ROMANIA IN THE FIELD OF OIL EXTRACTION WITH ESPECIAL REFERENCE TO AFRICA

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ACHIEVEMENTS AND CO-OPERATION POSSIBILITIES OF ROMANIA IN THE FIELD OF OIL EXTRACTION WITH SPECIAL REFERENCE TO AFRICA

In the history of the oil industry Romania is named, in 1857, as the first country in the world with an official production of 275 t. The same year Bucharest was the first town to be lit with lamp oil (kerosene), which had been produced in the field refinery built close to the town of Ploiesti.

In Romania the oil and gas extraction industry is co-ordinated by the Ministry of mines, oil and geology, which controls the specialized enterprises carrying out operations connected with exploration, production and the transport of crude oil to refineries.

Within the Ministry of mines, oil and geology, a Central Institute carries out research and design activities. It has a specialized staff and laboratories equipped with modern apparatuses.

The Ministry for mines, oil and geology, through its State Company for Foreign Trade - GEOMIN - is responsible for technical and economical co-operation with foreign countries, being backed by the human and technical potentialities of the Romanian oil and gas industry.

In the course of its 115 years of practice, the Romanian oil industry has gained rich and varied technical, financial and organizing experience.

The need for high quality fuels and raw materials derived from oil and gas, and their importance in the modern economy brought about significant development in Romania, over the last 25 years. Considerable investment funds were granted and scientific research improved in all the fields.

One of the most important activities included in the geological surveys, was the development of exploration to increase hydrocarbon reserves by identifying reserves both in formerly known areas and in other new ones.

As part of the complex geological surveys, geological and geophysical maps were drawn up for the purpose of designing and following up surveying and exploration activities, as well as seismic synthesis maps.

The geophysical surveys for hydrocarbons in Romania are carried out by a specialized enterprise, namely "The Enterprise for Geological and Geophysical Survey of Hydrocarbons" (IPGGH) within the Ministry of mines, oil and geology, which has 20 years experience in this field.

The enterprise has striven to bring the technology used up-to-date and to keep abreast of progress in the field of geophysical and especially seismic surveys in respect of both field technologies and the data processing.

IPGGH - staffed by highly skilled personnel - carries out world standard geophysical surveys.

In field work various technologies are applied in order to achieve continuous improvement and adaptation to the conditions existent in Romania.

The latest technique applied in field work is the numerical recording of seismic data. Apparatuses with a high technical standard of performance allow the improvement of direct recordings, automation of recording operations, etc., thus ensuring accuracy, increased productivity and finally increased efficiency in seismic work.

For the seismic surveying of areas with intricate tectonics and morphology an original method was successfully applied: multiple spread recording - implying no restrictions in placing the production and reception points. This highly flexible method adapted to difficult areas (rough relief, etc.) notaccessible for conventional seismic methods, allows tridimensional recordings suitable for the most modern processing.

The multiple covering - the most widespread method in the world was continuously improved and adapted to condtions existent in Romania, aiming at the attenuation of multiple reflexion and the increase of survey depth with a view to gathering data from old geological formations.

Marine seismic was used to survey the Romanian Continental Platform of the Black Sea, using numerical recording and new systems for positioning (type HIFIX) and generating seismic energy as well (type FLEXOTIR).

Simultaneously with its field work, IPGGH, has continuously improved the methods of processing geophysical data. The numerical processing of data is applied to seismic surveys. With that end in view this enterprise is endowed with a modern processing center.

The processing system includes: deconvolutions time variable, automatic filtering, bi and tridimensional mirations, speed analyses, map contouring, etc.

A new method of multiple device processing of seismic recordings was used by IPGGH to process data collected in areas with complicated tectonics and morphology by multiple spread seismics. The method involves the statistical processing of data allowing the correlation of several recordings coming from the same shooting point. Tridimensional migration is a superior stage in data processing and results reflect very closely the existing substrata.

The results speak for the efficiency of this type of processing in eliminating disturbing waves and rendering conspicuous the useful waves. It is both economic and rapid.

The modern processing of geophysical data includes gravimetric and magnetic processing as well. IPGGH, therefore, carries out numerical processings with the computers for processing relief corrections and for calculating depth and mass, gravimetric and magnetic effects and quantitative interpretations by geometric models.

Based on both the data obtained by the method described above and on the data gathered from the exploration wells complex geological studies have been carried out for major structural units and for geological areas and formations continuously following the stratigraphic profile of prospection and exploration wells and carrying out paleontological and petrographic surveys.

Special attention was paid and is continuously paid to laboratory geo-chemical research in order to determine the criteria for the identification of rocks generating hydrocarbons. Thus, new formations of major interest for hydrocarbons were identified in different productive areas of the country.

As regards geophysics, research was aimed at adapting the methods of geo-chemical and electrometric surveys to problems specific to the oil industry and at improving the methods of quantitative and qualitative interpretation of geophysical well logs. As a matter of interest we mention the determination, in certain geological conditions of the water gas contour for some Romanian deposits leading to a better knowledge of the physical values of collectors.

The results of the last years - due to intense geological and geophysical works and to geological drilling have led to the demarcation of new productive areas in Romania able to ensure increased production of oil and gas.

The Romanian oilfield equipment industry is manufacturing all types of drilling units, from the lightest: for gelogical drillings, to super-heavy units for 7,000 m depth. More than half the number of these units are exported all over the world; among the African countries using Romanian drilling and production equipment are Algeria, Egypt, Ghana.

When drilling wells, the improvement of drilling parameters, footage, cost per ft. drilled, etc. mechanic. speed is continuously aimed at the optimization of drilling conditions and modern drilling methods being applied.

On the basis of laboratory research concerning rock breaking the characteristics of formation were determined; new well drilling methods were drawn up, new types of tubing, new type-dimensions of drilling bits, core-bits, drill pipes made of special steels, drilling collars of different profiles were assimilated depending on the above characteristics.

At the same time the methods and the apparatuses for well holes surveying were improved and new modern methods for qualitative and quantitative processing of data were introduced.

New additives for drilling fluids and cement paste resistant to high temperatures and pressures, new methods and technologies for preventing and fighting against lost circulations were drawn up based on laboratory research and field experiments.

In Romania, up to the end of 1972 numerous deep wells were drilled, the deepest reaching 6,204 m (20,300 ft.).

An important factor in the continuous increase of crude oil and gas production was the scientific exploitation of deposits corresponding to the level reached by deposit engineering and the introduction on a wide scale of modern methods for water and gas injection. A significant yearly rise of production and increase of crude oil recoverable reserves was ensured by applying exploitation designs drawn up by the Research and Technological Design Institute for Oil and Gas Industry of Cîmpina.

This Institute has designed and built models aiming at the improvement of the present methods and the development of new exploitation methods. Among these improvements one can mention the possibility of initiating processes for maintaining the pressure at values inferior to the saturation pressure for increasing the differential exploitation pressure between the injection wells area and the reaction wells area at oil deposits with bottom water and for bringing the feeding contours near the exploitation area in the case of deposits with marginal water areas.

As regards the new exploitation methods, the main field-tested achievement consists of the possibility of advantageous financial exploitation by internal combustion or, if necessary, by super-heated steam injection, in case of deposits with high viscosity crude oil as well as in securing a final recovery factor 3 or 4 times higher than the value obtained by primary methods.

The deep pumping and gaslift were significantly improved from the technological point of view by improved pump construction and by the extension of continuous and intermittent gas lift. In this field new gas lift devices and methods were developped resulting in the increase of well output and the reduction of gas consumption.

Significant results were obtained in oil fields by applying the results of research concerning the increase of well productivity, hydraulic breakage of productive formations, the treatment of layers with solvents and indigenous tensioactive substances, thermo-chemical treatment, fighting against sand rush, etc. High flow production from wells in deposits with high flood level resulted in an increase of crude oil flow and the reduction of cost per ton of crude oil.

Remarkable financial effects were obtained by applying national research to treatment, transport and storage of crude oil as well. For treatment of emulsified crude oil, the application of synthetized non-ionic desemulsifiers produced by the Institute for technical research and design for crude oil and gas extraction of Cîmpina was extended.

The method of collecting, separation, treatment and transport of crude oil in a closed system was introduced resulting in the simplification of technological units and the reduction of light fraction losts of crude oil.

A high level of recovery of easy liquefiable compounds and reduced specific investments were ensured by building degasolination units using the Romania method of thermic absorption degasolination patented in several countries.

Elaboration of new methods and inhibitors based on Romanian patents enabled significant results to be obtained in fighting against the corosion of bottom equipment as well as of surface units in oil fields, resulting ir metal savings, reduction of investments by extending their operating life and in a reduction of costs.

The Romanian oil industry developed year by year as a result of the harmonious development of fundamental and practical research, of the close relation between research and production activity, and the continuous support of enterprises in the application of research results.

The State paid much attention and especially supported the development of productive forces in the conditions of the contemporary technical and scientifical revolution, the endowment of the oil industry with high performance equipment and machinery, the extension of automation, scientific control and organization of production, training of more and more skilled workers and specialists.

Romanian schools have trained and formed numerous specialists from developing countries including African countries, such as: Algeria, Nigeria, Egypt, etc.

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Based on the practice and technical potential mentioned above, Romania has entered into co-operation ventures with African countries, as far back as in 1962, when a group of Romanian geologists and geophysicists studied the geological documentation concerning some sedimentary basins in Ghana, carried out research works in these basins and finaly drew up a report on oil field prospects and the minimal

geological works program to be further carried out as well. As a result, Romanian personnel with local technicians, using Romanian made equipment, drilled two wells on the Atlantic Coast, in the Keta basin. The wells did not produce crude oil but some of the observations were encouraging for the research of marine sediments, resulting in the discovery of hydrocarbon deposits.

In 1964 another group of Romanian specialists studied in Egypt the basin of the Nile, calling the attention to the hydrocarbons prospects in this structural unit, now in exploration.

In 1966 some Romanian specialists studied the documentation existing in Somalia on the geological results obtained through works carried out by foreign companies. Based on the above and on the literature data in 1967 a report was drawn up concerning oilfield prospects in Somalia, officially submitted to the Mining Ministry of Somalia.

The conclusions of the report recommended a thorough knowledge of geological data resulting from the works carried out.

In 1967 Romania granted technical assistance in Ethiopia through a geologist who studied the oil prospects of the sedimentary formations of the country, drawing up a report with proposals for exploration works, that was submitted to competent authorities.

Romania has also granted technical assistance for drawing up the designs and studies necessary for the exploitation of crude oil deposits in Egypt.

Starting with 1968, Romania exported 15 drilling units to Algeria and a number of more than 150 Romanian specialists worked and are working now granting technical assistance for all the activities connected with the oil extraction industry.

In 1970-1972 the co-operation with some countries in Central Africa started when a number of Romanian specialists were sent to Zambia, Congo-Brazzaville and Sudan, where they studied the geological data, carried out some field works and gathered rocks to be analysed in the Romanian laboratories. Based on the above, geological reports were drawn up on the oil prospects of sedimentary formations in these countries, reports that were then submitted to competent authorities.

As regards the oil prospects of the paleozoic-mezozoic sedimentary formations (Karroo system) in Zambia, in order to get more concrete data on the sediments' thicknesses it was suggested that regional air-magnetometric surveys be undertaken in the western part of the country.

The Zambian authorities have taken into consideration this proposal and carried out even more detailed works than initially

suggested. The results are being analysed by the Romanian specialists and a detailed report is to be drawn up in the first quarter of 1973 for submission to the Zambian authorities.

A group of Romanian specialists have also estimated the oil prospects of the mezozoic sedimentary formations from the Congolese Trough in the Republic of Congo Brazzaville.

The analysis of geological surveys carried out so far in the Republic of Sudan, made it possible for a group of Romanian research workers to appreciate the gas-oil prospects of the Cuakin archipelago, located on the Red Sea shelf area.

The report of specialists, including as well a minimal program of geological research works required in the future, was submitted to the authorities of Sudan in January 1973.

As we have pointed out at the beginning of this paper, GEOMIN is the Romanian Foreign Trade Company of the Ministry of Mines, Oil and Geology, authorized to negociate and conclude contracts for economic collaboration and co-operation in the field of the oil industry and is now negotiating new mutual advantageous ventures with several African countries.

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